Grain Boundary Fracture of α Brass Bicrystals at an Intermediate Temperature Range

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through two metastable phases (MS-I and MS-II) and finally to stable phases. The crystalline structure of MS-I phase agrees well with that of equilibrium phase at room temperature for the X-Y binary alloys.

Strain Hardening and Recovery in High-Temperature Deformation by Pure-Metal Mode

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Nippon Kinzoku Gakkai Shi (J. Jpn. Inst. Met.), **42** (1978), 432.

By a new method using the stress relaxation test, the coefficient of strain hardening without recovery (h) and the rate of recovery without strain hardening (r) are estimated in high-temperature deformation of *fcc* aluminum and *bcc* iron, where the internal stress is confirmed to be nearly 100% of the flow stress. Both h and r are dependent on applied stress σ and temperature T in a steady-state deformation, and are represented by $h=h_0(\sigma/E)^m \exp(-Q_h/RT)$ and $r=r_0\ (\sigma/E)^l \exp(-Q_r/RT)$, where h_0 and r_0 are constants, E is Young's modulus and $m=-0.88(-1.5)$, $l=4.3(3.2)$, $Q_h=-22(-76)$ kJ/mol, $Q_r=88(132)$ kJ/mol for aluminum(iron). During a transient state of tensile deformation in the constant strain-rate test, h and r are nearly independent of strain. The activation energy for recovery (Q_r) is found to be appreciably smaller than that of self-diffusion, and then possible roles of pipe-diffusion and strain-enhanced diffusion in dynamic recovery are discussed.

The Structure of Oxygen-Adsorbed Copper Surfaces Expressed as an "Oxygen Pressure-Temperature Diagram"

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Nippon Kinzoku Gakkai Shi (J. Jpn. Inst. Met.), **42** (1978), 682.

The structure of oxygen-adsorbed copper {100} and {110} surfaces has been studied by low energy electron diffraction (LEED) technique. The surface structure data obtained by the present author and other researchers are summarized in a diagram as a function of surface temperature and oxygen pressure. Attention has been given to unify the notations of the surface structures in order to facilitate comparison of the data. The diagram, called "oxygen pressure-temperature diagram", is a kind of the phase diagram for the surface, indicating the dependence of surface structure on oxygen pressure and heat treatment.

Grain Boundary Fracture of α Brass Bicrystals at an Intermediate Temperature Range

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Nippon Kinzoku Gakkai Shi (J. Jpn. Inst. Met.), **42** (1978), 1096.

Deformation and grain boundary fracture behaviours of α brass bicrystals were examined. The results are summarized as follows:

(1) The temperature dependence of the ductility of α brass bicrystals

accompaning intergranular fracture is similar to that observed in α brass polycrystals.

(2) The transition from transgranular to intergranular fracture starts at about 470 K and again a transgranular fracture appears at about 770 K: i.e., the intergranular fracture occurs in the temperature range of 470 to 770 K. It is note worthy that the lower transition temperature (470 K) corresponds to the onset of the inverse temperature dependence of yield stress. Also, the temperature at which the minimum value of ductility reveals coincides with that at which a peak in the yield stress appears.

(3) Though the intercrystalline fracture accompanies the separation at the grain boundary plane macroscopically, it is a ductile fracture in the neighbourhood of grain boundary microscopically. Thus, apparent intergranular fracture seems to be caused by the coalescence of micro cleavage cracks along {111} planes, which are induced by the stress concentration due to dislocation pile-ups.

(4) From those observations mentioned above, it is clear that the dynamic strain aging behaviour plays an important role in the intergranular fracture of α brass bicrystals.

XPS and Electrochemical Studies of Effects of Metalloid Additives on Corrosion Behaviors of Amorphous Iron-Chromium Alloys

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Boshoku Gijutsu (Corros. Eng.), **27** (1978), 279.

XPS and electrochemical methods have been used to investigate the influences of metalloid additives, phosphorus, carbon, boron and silicon on corrosion behaviors of amorphous iron-chromium alloys. It was found that phosphorus accelerates active dissolution prior to passivation. This leads to the rapid enrichment of trivalent chromium in the surface film and to the rapid formation of the surface film with a good protective quality. On the contrary, silicon and boron do not facilitate active dissolution and interfere the chromium enrichment in the surface film owing to incorporation of silicate and borate in the surface film.

Application Examples of Semiquantitative X-Ray Photoelectron Spectroscopic Analysis

Kichinosuke Hirokawa and Masaoki Oku

Bunseki Kagaku (Jpn. Analyst), **27** (1978), T5.

Semiquantitative analytical applciation of X-ray photoelectron spectroscopy has been investigated. The estimation of a layer composition under surface as well as a surface layer composition is described for nickel-copper alloys. The possible utilities of the X-ray photoelectron technique to the study of precipitation phenomena are also explored, which include the coprecipitation of lead sulfate with barium sulfate and the post precipitation of zinc sulfide on the surface of copper sulfide.